

## Biology (BL) Modules

BL4224 Molecular Mechanisms of Membrane Trafficking				
<b>SCOTCAT Credits:</b>	15	SCQF Level 10	<b>Semester</b>	2
<b>Academic year:</b>	2019/0			
<b>Planned timetable:</b>	To be arranged.			
<p>Membrane trafficking mediates the transport of substances between different cellular organelles and the secretion of substances from cells. As such, regulation of membrane trafficking is applicable to all cell types, but especially to specialised secretory cells such as neurons, which secrete neurotransmitters and pancreatic beta-cells which secrete insulin. This module will consider how molecules control the movement of substances through the secretory pathway, but will focus on how cells regulate the release of contents. Within the module you will look at the proteins involved, the different experiments used to study the process and how model organisms are enhancing our understanding.</p>				
<b>Pre-requisite(s):</b>	Before taking this module you must pass BL3303			
<b>Learning and teaching methods of delivery:</b>	<b>Weekly contact:</b> 1 x 2-hour seminar (x 11 weeks)			
<b>Assessment pattern:</b>	2-hour Written Examination = 50%, Coursework = 50%			
<b>Re-assessment pattern:</b>	2-hour Written Examination = 50%, Existing Coursework = 50%			
<b>Module coordinator:</b>	Dr G R Prescott			
<b>Module teaching staff:</b>	Dr G Prescott, Dr J Tilsner			

BL4249 Scientific Diving				
<b>SCOTCAT Credits:</b>	15	SCQF Level 10	<b>Semester</b>	2
<b>Academic year:</b>	2019/0			
<b>Planned timetable:</b>	Full Time 2-3 weeks in January/February			
<p>This module will provide both theoretical and practical experience of the techniques used by scientific divers. The module is restricted to students who have an existing diving qualification (PADI Advanced Open Water Diver or BSAC Sports Diver or equivalent). Seminars during the field trip will cover diving safety, dive project planning, management, risk assessment and the theory behind underwater surveying techniques. Abroad, students will receive training in underwater marine identification, construction and deployment of underwater surveys and sampling techniques, gaining practical experience of recording, analysing and interpreting survey data. Then they conduct a mini-research project using suitable survey techniques and present their findings through a report and a presentation. There are additional costs attached to this module which the student will be expected to meet.</p>				
<b>Pre-requisite(s):</b>	"permission of biology honours adviser required, padi advanced open water diver or bsac sports diver (or equivalent)". Before taking this module you must pass BL4251			
<b>Learning and teaching methods of delivery:</b>	<b>Weekly contact:</b> 8 hours per day for 2 weeks.			
<b>Assessment pattern:</b>	Coursework = 100%			
<b>Re-assessment pattern:</b>	Resubmission of failed item(s) of Coursework			
<b>Module coordinator:</b>	Dr M M Borges Da Costa Guint Barbosa			
<b>Module teaching staff:</b>	Team taught			

## Biology - Postgraduate - 2019/0 - September - 2019

BL4251 Tropical Marine Biology				
<b>SCOTCAT Credits:</b>	15	SCQF Level 10	<b>Semester</b>	1
<b>Academic year:</b>	2019/0			
<b>Planned timetable:</b>	To be arranged.			
<p>The goal of this module is to examine the ecological and biological principles underpinning the major tropical marine ecosystems. The module provides an understanding of the ecological processes that control tropical marine ecosystems, and considers the organisms that are characteristic of each. All the major tropical marine habitats will be considered, but with a focus on coral reef, seagrass and mangrove ecosystems. The module also tackles topical research areas on the subject through student-led seminars, which will vary depending on the latest scientific research and the specific interests of participants. On completion of the module, students will have an understanding of coral reef, mangrove and seagrass ecology. They will understand the biology and physiology of corals and be able to identify the major phyla associated with tropical marine ecosystems. The module will also provide an understanding of the threats to tropical marine habitats, current research trends on tropical marine systems, and the scientific approaches and techniques used to tackle scientific questions relating to tropical marine biology.</p>				
<b>Learning and teaching methods of delivery:</b>	<b>Weekly contact:</b> Lectures and seminars.			
<b>Assessment pattern:</b>	Coursework = 100%			
<b>Re-assessment pattern:</b>	Resubmission of failed item(s) of Coursework			
<b>Module coordinator:</b>	Dr M M Borges Da Costa Guint Barbosa			

BL4254 Fisheries Research				
<b>SCOTCAT Credits:</b>	15	SCQF Level 10	<b>Semester</b>	2
<b>Academic year:</b>	2019/0			
<b>Planned timetable:</b>	To be arranged.			
<p>This module will provide an introduction to the utilisation of fish stocks in a sustainable way. It will focus on how the status of these stocks can be assessed, the problems associated with determining catch limits, and how advice from fisheries scientists is communicated to managers. There will be a mixture of dedicated lectures (including talks from outside experts), student-led seminars, tutorials and practical computer sessions.</p>				
<b>Pre-requisite(s):</b>	Before taking this module you must pass BL3309			
<b>Learning and teaching methods of delivery:</b>	<b>Weekly contact:</b> 1 x 2-hour seminar (x 11 weeks)			
<b>Assessment pattern:</b>	1.5-hour Written Examination = 30%, Coursework = 70%			
<b>Re-assessment pattern:</b>	1.5-hour Written Examination = 30%, Existing Coursework = 70%			
<b>Module coordinator:</b>	Dr C G M Paxton			
<b>Module teaching staff:</b>	Dr C Paxton			

BL4260 Biological Oceanography				
<b>SCOTCAT Credits:</b>	15	SCQF Level 10	<b>Semester</b>	1
<b>Academic year:</b>	2019/0			
<b>Planned timetable:</b>	To be arranged.			
<p>This module will provide primarily seminar-based instruction on the fundamentals of Biological Oceanography (BO). A few introductory lectures will focus on basic principles in BO and oceanography, including physical and geochemical principles as they apply to biological oceanography. Students will present seminars on particular focus areas within each lecture topic, based upon reading primary literature. BO is a broad field, so the module will provide an overview of the field with depth in a few chosen areas. At least one practical will be offered on the use of remote-sensing data for ocean observation, and we hope to develop a practical of zooplankton sampling. This module should coordinate especially well with marine acoustics and scientific diving.</p>				
<b>Pre-requisite(s):</b>	Before taking this module you must pass BL3318			
<b>Learning and teaching methods of delivery:</b>	<b>Weekly contact:</b> 10 x 2-hour seminars (x 6 weeks)			
<b>Assessment pattern:</b>	2-hour Written Examination = 40%, Coursework = 60%			
<b>Re-assessment pattern:</b>	2-hour Written Examination = 40%, Existing Coursework = 60%			
<b>Module coordinator:</b>	Prof P Miller			

BL4263 The Question of Culture in Animals				
<b>SCOTCAT Credits:</b>	15	SCQF Level 10	<b>Semester</b>	2
<b>Academic year:</b>	2019/0			
<b>Planned timetable:</b>	To be arranged.			
The existence and extent of social learning and cultural transmission in non-humans is a very active area of current research, as well as of controversy, with vigorous ongoing debate. The aim of this module is to provide an introduction to this area through considering the conceptual issues and direct and indirect evidence for cultural transmission in a range of non-human animals, including insects, fish, birds, primates and cetaceans. We will consider what is meant by the term 'culture', how it is used and studied in the human context, how it can be studied in non-humans, and the evidence for and against such processes being present in a range of non-human societies.				
<b>Pre-requisite(s):</b>	Before taking this module you must pass BL3319			
<b>Learning and teaching methods of delivery:</b>	<b>Weekly contact:</b> 10 x 2 hour class meetings, supported by extensive independent study			
<b>Assessment pattern:</b>	100% Coursework			
<b>Re-assessment pattern:</b>	100% Coursework			
<b>Module coordinator:</b>	Dr L E Rendell			
<b>Module teaching staff:</b>	Dr Luke Rendell, Dr Michael Webster, Prof Christian Rutz, Dr Ellen Garland, Dr Catherine Hobaiteer			

BL4274 Evolutionary Developmental Biology				
<b>SCOTCAT Credits:</b>	15	SCQF Level 10	<b>Semester</b>	1
<b>Academic year:</b>	2019/0			
<b>Planned timetable:</b>	To be arranged.			
Evolution of new morphologies involves changes to the development of organisms. The field of evolutionary developmental biology is thus becoming established as a major and essential component of any comprehensive understanding of evolutionary biology. This module aims to cover some of the main, current themes in evolutionary developmental biology. Since animal life evolved in the sea, much of what we can learn about the major events in animal evolution can be obtained from studying marine invertebrates. Consequently the examples covered in this module will tend to be drawn from these organisms.				
<b>Pre-requisite(s):</b>	Permission of biology honours adviser required			
<b>Learning and teaching methods of delivery:</b>	<b>Weekly contact:</b> 1 x 2-hour seminar ( x 10 weeks).			
<b>Assessment pattern:</b>	Coursework = 100%			
<b>Re-assessment pattern:</b>	Resubmission of failed item(s) of Coursework			
<b>Module coordinator:</b>	Dr D E K Ferrier			
<b>Module teaching staff:</b>	Dr D Ferrier, Dr I Somorjai			

## Biology - Postgraduate - 2019/0 - September - 2019

BL4280 Evolution and Human Behaviour				
<b>SCOTCAT Credits:</b>	15	SCQF Level 10	<b>Semester</b>	1
<b>Academic year:</b>	2019/0			
<b>Planned timetable:</b>	To be arranged.			
Evolutionary biologists, anthropologists and psychologists have taken evolutionary principles and used them to explain a range of human characteristics, such as homicide, religion and sex differences in behaviour. Other researchers are sceptical of these interpretations, and critical of the methods. Moreover, researchers disagree as to the best ways to use evolution to explore humanity, and a number of schools of thought have emerged. This module will introduce and critically evaluate the main evolutionary approaches currently being used, including socio-biology, evolutionary psychology, behavioural ecology and gene-culture co-evolution.				
<b>Pre-requisite(s):</b>	Permission of biology honours adviser required			
<b>Learning and teaching methods of delivery:</b>	<b>Weekly contact:</b> 1 x 2-hour seminar (x 10 weeks).			
<b>Assessment pattern:</b>	1.5-hour Written Examination = 40%, Coursework = 60%			
<b>Re-assessment pattern:</b>	1.5-hour Written Examination = 40%, Existing Coursework = 60%			
<b>Module coordinator:</b>	Dr M M Webster			
<b>Module teaching staff:</b>	Dr M Webster. Dr K Cross, Dr L Dean, Dr C Evans, Dr A Navarrete			

BL4282 Biology and Behaviour of Social Insects				
<b>SCOTCAT Credits:</b>	15	SCQF Level 10	<b>Semester</b>	2
<b>Academic year:</b>	2019/0			
<b>Planned timetable:</b>	To be arranged.			
This module will examine and compare the biology of the four main groups of social insects: termites, ants, wasps and bees. Sociality in other groups (aphids, beetles) will also be considered briefly. Topics will include the evolution of sociality, social organisation and social control systems, reproductive strategies, and diverse communication modes including pheromonal systems, acoustic systems, and 'bee dances'. Aspects of foraging behaviour and learning abilities will also be considered, particularly for ants (leaf cutter ants, army ants, slave-making ants) and for bees both eusocial and semi-social. There will be strong evolutionary, ecological and behavioural themes, and relevance also to conservation issues.				
<b>Pre-requisite(s):</b>	Permission of biology honours adviser required			
<b>Learning and teaching methods of delivery:</b>	<b>Weekly contact:</b> 1 x 3-hour seminar (x 11 weeks).			
<b>Assessment pattern:</b>	Coursework = 100%			
<b>Re-assessment pattern:</b>	Resubmission of failed item(s) of Coursework			
<b>Module coordinator:</b>	Prof P G Willmer			
<b>Module teaching staff:</b>	Team taught			

BL4801 Aquaculture and Fisheries				
<b>SCOTCAT Credits:</b>	10	SCQF Level 10	<b>Semester</b>	Both
<b>Academic year:</b>	2019/0			
<b>Availability restrictions:</b>	Not available to undergraduate students			
<b>Planned timetable:</b>	To be arranged.			
This module provides an introduction to the global importance of aquaculture with fisheries industries worldwide. The module will compare both aquaculture and fishing industries with terrestrial, agricultural sources of food production. The global markets for aquaculture, fisheries and agricultural products will be assessed. The environmental interactions of aquaculture will be discussed with relation to the definition of, and development of, sustainable aquaculture practices. The principles of developing sustainable aquaculture in different global environments/conditions will be discussed.				
<b>Learning and teaching methods of delivery:</b>	<b>Weekly contact:</b> Distance Learning : 4 hours of lectures (x 5 weeks) and 3 hours of tutorials ( x 3 weeks).			
<b>Assessment pattern:</b>	2-hour Written Examination = 60%, Coursework = 40%			
<b>Re-assessment pattern:</b>	3-hour Written Examination = 100% TBC			
<b>Module coordinator:</b>	Dr N Hazon			
<b>Module teaching staff:</b>	Dr J A David			

## Biology - Postgraduate - 2019/0 - September - 2019

BL4802 Biology for Aquaculture				
<b>SCOTCAT Credits:</b>	20	SCQF Level 10	<b>Semester</b>	Both
<b>Academic year:</b>	2019/0			
<b>Availability restrictions:</b>	Not available to undergraduate students			
<b>Planned timetable:</b>	To be arranged.			
This module provides an understanding of the fundamental biology of aquaculture species. This includes the anatomy and physiology of both invertebrate and vertebrate aquaculture species. The interaction of aquaculture species with the aquatic environment and the requirements for developing sustainable aquaculture will be assessed.				
<b>Anti-requisite(s)</b>	You cannot take this module if you take BL4803 or take BL4804			
<b>Learning and teaching methods of delivery:</b>	<b>Weekly contact:</b> Distance learning: 2 x 2-hour lecture (x 10 weeks) and 1 x 3-hour tutorial (x 10 weeks)			
<b>Assessment pattern:</b>	2-hour Written Examination = 60%, Coursework = 40%			
<b>Re-assessment pattern:</b>	3-hour Written Examination = 100% TBC			
<b>Module coordinator:</b>	Dr N Hazon			
<b>Module teaching staff:</b>	Dr J A David			

BL4803 Biology for Aquaculture - Invertebrates				
<b>SCOTCAT Credits:</b>	10	SCQF Level 10	<b>Semester</b>	Both
<b>Academic year:</b>	2019/0			
<b>Availability restrictions:</b>	Not available to Undergraduate students			
<b>Planned timetable:</b>	To be arranged.			
This module provides an understanding of the fundamental biology of invertebrate aquaculture species. This includes the anatomy and physiology of appropriate aquaculture species. The interaction of aquaculture species with the aquatic environment and the requirements for developing sustainable aquaculture will be assessed.				
<b>Anti-requisite(s)</b>	You cannot take this module if you take BL4802			
<b>Learning and teaching methods of delivery:</b>	<b>Weekly contact:</b> 4 hours of lectures (x 5 weeks) and 3 hours of tutorials (x 3 weeks).			
<b>Assessment pattern:</b>	2-hour Written Examination = 60%, Coursework = 40%			
<b>Re-assessment pattern:</b>	3-hour Written Examination = 100%			
<b>Module coordinator:</b>	Dr N Hazon			
<b>Module teaching staff:</b>	Dr J A David			

BL4804 Biology for Aquaculture - Vertebrates				
<b>SCOTCAT Credits:</b>	10	SCQF Level 10	<b>Semester</b>	Both
<b>Academic year:</b>	2019/0			
<b>Availability restrictions:</b>	Not available to undergraduate students			
<b>Planned timetable:</b>	To be arranged.			
This module provides an understanding of the fundamental biology of vertebrate aquaculture species. This includes the anatomy and physiology of appropriate aquaculture species. The interaction of aquaculture species with the aquatic environment and the requirements for developing sustainable aquaculture will be assessed.				
<b>Anti-requisite(s)</b>	You cannot take this module if you take BL4802			
<b>Learning and teaching methods of delivery:</b>	<b>Weekly contact:</b> 4 hours of lectures (x 5 weeks), and 3 hours of tutorials (x 3 weeks).			
<b>Assessment pattern:</b>	2-hour Written Examination = 60%, Coursework = 40%			
<b>Re-assessment pattern:</b>	3-hour Written Examination = 100% TBC			
<b>Module coordinator:</b>	Dr N Hazon			
<b>Module teaching staff:</b>	Dr J A David			

BL5031 Research Skills for Animal Behaviour				
<b>SCOTCAT Credits:</b>	30	SCQF Level 11	<b>Semester</b>	1
<b>Academic year:</b>	2019/0			
<b>Planned timetable:</b>	tbc			
This core module for MSc Animal Behaviour will focus upon the key skills for modern animal behaviour research, including experimental design, behaviour genetics, applications to conservation biology. Lectures will be supported by student-led seminars and by practical classes which will introduce some of the applied skills relevant to each of these areas.				
<b>Learning and teaching methods of delivery:</b>	<b>Weekly contact:</b> 3 lectures (weeks 1 - 5), 4 seminars (weeks 1 - 5), 8 practicals (2 - 5), 2 tutorials			
<b>Assessment pattern:</b>	Coursework (x5) = 100%			
<b>Re-assessment pattern:</b>	Coursework (x5) = 100%			
<b>Module coordinator:</b>	Dr M M Webster			
<b>Module teaching staff:</b>	Dr Michael Webster			

BL5032 Communication Skills for Animal Behaviour Research				
<b>SCOTCAT Credits:</b>	15	SCQF Level 11	<b>Semester</b>	2
<b>Academic year:</b>	2019/0			
<b>Planned timetable:</b>	tbc			
This core module will focus upon the key communication skills vital in modern animal behaviour research. Students will be trained in communicating science to a variety of different audiences, including peers, journalists and the public. They will be trained in writing scientific articles and in critical analysis of each other's writing. This will provide insight into how the peer review system works. At the end of the course they will compile a volume of the course journal containing their work. They will produce a short video presenting an accessible overview of a research article that will be used in outreach through a display in the Bell-Pettigrew Museum. Students will also critically analyse a piece of popular science writing or journalism and investigating primary scientific literature behind it. This module will be taught through a combination of student-led seminars and discussion groups chaired by staff members and invited speakers from CAPOD and the press and outreach offices.				
<b>Learning and teaching methods of delivery:</b>	<b>Weekly contact:</b> 3 seminar (weeks 1 - 11)			
<b>Assessment pattern:</b>	Coursework (x4) = 100%			
<b>Re-assessment pattern:</b>	Coursework (x4) = 100%			
<b>Module coordinator:</b>	Dr M M Webster			
<b>Module teaching staff:</b>	Michael Webster			

BL5041 Predators and Prey				
<b>SCOTCAT Credits:</b>	15	SCQF Level 11	<b>Semester</b>	2
<b>Academic year:</b>	2019/0			
<b>Planned timetable:</b>	tbc			
Predators and prey are major sources of selection upon each other and sometimes co-evolve in evolutionary arms races. This module will investigate the different behavioural adaptations that have evolved for capturing prey and avoiding being captured respectively, critically evaluating the theoretical bases and evidence for these effects and discussing important gaps in our knowledge. These will include grouping and coordinated movement, camouflage and crypsis and mobbing, among other behaviours.				
<b>Learning and teaching methods of delivery:</b>	<b>Weekly contact:</b> 2 seminars (weeks 1 -11), 3 practicals (weeks 2 and 7).			
<b>Assessment pattern:</b>	Coursework (x2) and Presentation = 100%			
<b>Re-assessment pattern:</b>	Coursework (x2) and Presentation = 100%			
<b>Module coordinator:</b>	Dr M M Webster			
<b>Module teaching staff:</b>	Dr Michael Webster			

BL5042 Cognition				
<b>SCOTCAT Credits:</b>	15	SCQF Level 11	<b>Semester</b>	2
<b>Academic year:</b>	2019/0			
<b>Planned timetable:</b>	To be confirmed			
<p>In the 21st century animal cognition forms a significant component of animal behaviour and St Andrews has multiple researchers at the forefront of the field. In this module we will investigate the cognitive abilities of animals, with particular interest in understanding the adaptive value of those abilities. We will develop an understanding of animal cognition based on standard animal models (typically rats and pigeons), but we will extend those principles to addressing cognitive abilities in 'real' animals behaving in the 'real' world. We will use Shettleworth's book, already the key animal cognition text, as our starting point with student-led seminars providing breadth by presenting examples from the recent burgeoning of literature on non-model animals. The result will be a stimulating opportunity to develop a critical understanding of how animals perceive their world, how their cognitive abilities are shaped by that world and how those abilities lead to reproductive success.</p>				
<b>Learning and teaching methods of delivery:</b>	<b>Weekly contact:</b> 3-hours Seminars (11 weeks)			
<b>Assessment pattern:</b>	100% Coursework			
<b>Re-assessment pattern:</b>	100% Coursework			
<b>Module coordinator:</b>	Prof S D Healy			
<b>Module teaching staff:</b>	Professor Susan Healy			

BL5103 Population Biology				
<b>SCOTCAT Credits:</b>	15	SCQF Level 11	<b>Semester</b>	2
<b>Academic year:</b>	2019/0			
<b>Planned timetable:</b>	Weeks 5 - 7			
<p>Which human activities might put a population at risk? Can we find out why a wild population appears to be in decline? This module covers the essentials of population biology and population modelling. The principles taught will provide essential background to those who are interested in future careers that involve the conservation and management of wildlife populations..</p>				
<b>Learning and teaching methods of delivery:</b>	<b>Weekly contact:</b> 4 lectures (x 3 weeks), seminar (x 2 weeks), tutorial (x 1 week), lab (x 3 weeks)			
<b>Assessment pattern:</b>	Coursework = 100%			
<b>Re-assessment pattern:</b>	Resubmission of failed item(s) of Coursework			
<b>Module coordinator:</b>	Dr S C Smout			
<b>Module teaching staff:</b>	Team taught			

BL5104 Conservation and Management of Marine Mammals				
<b>SCOTCAT Credits:</b>	15	SCQF Level 11	<b>Semester</b>	2
<b>Academic year:</b>	2019/0			
<b>Planned timetable:</b>	Weeks 8 - 11			
<p>From the heated debates surrounding whaling to calls for seal culls to protect commercial fish stocks, issues pertaining to marine mammals feature regularly in the public domain and often polarise public opinion. Finding ways to address human-marine mammal conflicts and advise on mitigation have become important tasks for many marine mammal scientists. Through a series of lectures, seminars, debates and workshops, students will explore human-marine mammal interactions to better understand the underlying factors. They will learn to critically evaluate current conservation and management issues and will explore ways in which sound science can contribute to alleviate existing and future conflicts.</p>				
<b>Learning and teaching methods of delivery:</b>	<b>Weekly contact:</b> 3 lectures and 1 seminar each week for 4 weeks, plus 1 workshop in total.			
<b>Assessment pattern:</b>	Coursework = 100%			
<b>Re-assessment pattern:</b>	Coursework = 100%			
<b>Module coordinator:</b>	Dr S Heinrich			
<b>Module teaching staff:</b>	Team taught			

<b>BL5110 Principles of Marine Mammal Biology</b>				
<b>SCOTCAT Credits:</b>	30	SCQF Level 11	<b>Semester</b>	1
<b>Academic year:</b>	2019/0			
<b>Planned timetable:</b>	To be arranged.			
<p>This module is core to the MSc Marine Mammal Science and covers key concepts of marine mammal biology. The module introduces the zoogeography of marine mammals and the morphological, physiological and behavioural adaptations that have enabled this diverse group to successfully colonise all of the world's oceans and some freshwater systems. Lectures will focus on topical issues illustrating and contrasting some of the strategies shown by different marine mammal groups and the research techniques currently employed to study the diverse aspects of marine mammal biology and conservation. Student-led seminars and practical classes will complement the lecture series and will introduce some of the applied skills needed to investigate marine mammal ecology and behaviour, including the use spatial and acoustic tools.</p>				
<b>Learning and teaching methods of delivery:</b>	<b>Weekly contact:</b> 10 hours of lectures (x 5 weeks), 2 hours of seminars (x 5 weeks) and 4 hours of practicals (x 5 weeks)			
<b>Assessment pattern:</b>	Coursework = 100%			
<b>Re-assessment pattern:</b>	Coursework = 100%			
<b>Module coordinator:</b>	Dr S Heinrich			
<b>Module teaching staff:</b>	Team taught			

<b>BL5115 Mathematical and statistical modelling for Biologists</b>				
<b>SCOTCAT Credits:</b>	30	SCQF Level 11	<b>Semester</b>	1
<b>Academic year:</b>	2019/0			
<b>Planned timetable:</b>	To be arranged			
<p>Maths can be used to represent processes in nature, and to predict their outcomes. We will show how a statistical model can be fitted to biological data, allowing us to improve our understanding of the system concerned and our ability to make predictions about it.</p>				
<b>Learning and teaching methods of delivery:</b>	<b>Weekly contact:</b> 1 lecture (X 4 weeks) then 4 lectures (X 4 weeks), 4 R labs (X 5 weeks)			
<b>Assessment pattern:</b>	Coursework = 100%			
<b>Re-assessment pattern:</b>	Coursework = 100%			
<b>Module coordinator:</b>	Dr S C Smout			
<b>Module teaching staff:</b>	Dr S Smout, Dr L Rendell, Dr M Morrissey			

<b>BL5121 Current Issues in Marine Mammal Behaviour</b>				
<b>SCOTCAT Credits:</b>	15	SCQF Level 11	<b>Semester</b>	2
<b>Academic year:</b>	2019/0			
<b>Planned timetable:</b>	Weeks 5 - 7			
<p>Marine mammals are often seen as highly intelligent and complex in their behaviour. This module will investigate such claims by discussing current views and recent advances in the study of marine mammal social behaviour. Each student will present one topic to the class and lead the discussion on it. Topics covered will include brain evolution, dolphin signature whistles, referential communication, cetacean culture, equivalence classes, cooperation and concept formation.</p>				
<b>Learning and teaching methods of delivery:</b>	<b>Weekly contact:</b> 1 lecture and 9 seminars spread over 3 weeks.			
<b>Assessment pattern:</b>	1.5-hour Written Examination = 50%, Coursework = 50%			
<b>Re-assessment pattern:</b>	100% exam			
<b>Module coordinator:</b>	Prof V Janik			



<b>BL5122 Current Issues in Biologging</b>				
<b>SCOTCAT Credits:</b>	15	SCQF Level 11	<b>Semester</b>	2
<b>Academic year:</b>	2019/0			
<b>Planned timetable:</b>	Weeks 1 - 4			
<p>This module will present an introduction to biologging science: the theory and practice of logging and relaying physical and biological data using animal-attached tags. Lectures will cover the technology currently available for measuring animal movements, investigating behaviour, ecology and physiology, some of the challenges associated with tag design in terms of how data is stored and transmitted, and problems associated with data analysis and data display. Seminars will discuss some of the ethical and conservation issues that biologging science raises. Two practicals and the continuous assessment for this module introduce students to the difficulties collecting biologging data (using heart-rate dataloggers on themselves) and look at aspects of experimental design and how to write results in a publishable format. A further two practicals explore some of the methods used to view and analyse movement and diving data.</p>				
<b>Learning and teaching methods of delivery:</b>	<b>Weekly contact:</b> 1 - 2 lectures, 1 seminar and 1 practical class each week for 4 weeks.			
<b>Assessment pattern:</b>	Coursework = 100%			
<b>Re-assessment pattern:</b>	Resubmission of failed item(s) of Coursework			
<b>Module coordinator:</b>	Prof S K Hooker			
<b>Module teaching staff:</b>	Team taught			

<b>BL5124 Predator Ecology in Polar Ecosystems - a Field Course in Antarctica</b>				
<b>SCOTCAT Credits:</b>	15	SCQF Level 11	<b>Semester</b>	Full Year
<b>Academic year:</b>	2019/0			
<b>Planned timetable:</b>	lectures in S1, field course in S2 including 3 weeks in southern Argentina and Antarctica)			
<p>This module offers students the unique opportunity to gain theoretical and practical experience in polar ecology with special emphasis on top predators (cetaceans, pinnipeds, sea birds), ecosystem functionality and management of Antarctic marine living resources. Students will participate in a vessel-based expedition to Antarctica during the austral summer and will also explore southern Argentina. This field trip involves travelling to southern Argentina, conducting at-sea surveys during transit to/ from the Antarctic Peninsula, participating in shore-based activities, and exploring Antarctic coastal waters from small boats. Through a series of specialist lectures, workshops, on-board practicals, field excursions and dedicated observational studies students will gain in-depth understanding and critical awareness of the current scientific, conservation and management challenges of the Antarctic ecoregion. Upon return to St Andrews students will complete a specialist case study on a selected topic which will culminate in the presentation of a manuscript for submission to a journal. Participating students will need to cover all logistic expenses via payment of a substantial expedition fee.</p>				
<b>Pre-requisite(s):</b>	In taking this module you must have a medical certificate documenting fit for travel to remote antarctica			
<b>Anti-requisite(s)</b>	You cannot take this module if you take BL4301			
<b>Learning and teaching methods of delivery:</b>	<b>Weekly contact:</b> 8 x 1.5-hour lectures in S1 and several tutorials plus full day field practicals during the expedition.			
<b>Assessment pattern:</b>	Coursework = 100%			
<b>Re-assessment pattern:</b>	Resubmission of failed item(s) of Coursework			
<b>Module coordinator:</b>	Dr S Heinrich			
<b>Module teaching staff:</b>	Dr S Heinrich & Dr L Boheme			

## Biology - Postgraduate - 2019/0 - September - 2019

BL5125 Advanced Bioacoustics for Marine Mammal Science				
<b>SCOTCAT Credits:</b>	15	SCQF Level 11	<b>Semester</b>	2
<b>Academic year:</b>	2019/0			
<b>Planned timetable:</b>	Weeks 1 - 4			
Bioacoustics is an important topic in marine mammal science, because of the use the animals themselves make of sound, because it is often the most practical way to detect their presence, and because of the impacts anthropogenic sounds can have on acoustically sensitive species. This course provides an advanced survey of current topics, from understanding the physics of sound and how it is measured and analysed, through using sound to detect and monitor marine mammal presence, to the assessment and mitigation of anthropogenic noise impacts. There will be a strong emphasis on digital analysis and practical exercises designed to introduce students to the range of techniques and tools currently used in the field.				
<b>Learning and teaching methods of delivery:</b>	<b>Weekly contact:</b> 8 lectures and 8 practical classes, 3 tutorials and 4 hours of fieldwork over a 4 week period.			
<b>Assessment pattern:</b>	Coursework = 100%			
<b>Re-assessment pattern:</b>	Resubmission of failed item(s) of Coursework			
<b>Module coordinator:</b>	Dr L E Rendell			
<b>Module teaching staff:</b>	Team taught			

BL5304 Ecosystem-based Management of Marine Systems				
<b>SCOTCAT Credits:</b>	15	SCQF Level 11	<b>Semester</b>	2
<b>Academic year:</b>	2019/0			
<b>Planned timetable:</b>	To be arranged (Weeks 1 - 11)			
This module will introduce the concept of 'Ecosystem-based management', exploring its development from more simplistic, single-species approaches. Students will make case-studies in a workshop environment of iconic, managed ecosystems including the Southern Ocean and Australia's Great Barrier Reef.				
<b>Learning and teaching methods of delivery:</b>	<b>Weekly contact:</b> Lectures and seminars.			
<b>Assessment pattern:</b>	Coursework = 100%			
<b>Re-assessment pattern:</b>	Resubmission of failed item(s) of Coursework			
<b>Module coordinator:</b>	Prof A S Brierley			
<b>Module teaching staff:</b>	Team taught			

BL5310 Marine Biodiversity and Ecosystem Function				
<b>SCOTCAT Credits:</b>	15	SCQF Level 11	<b>Semester</b>	1
<b>Academic year:</b>	2019/0			
<b>Planned timetable:</b>	To be arranged			
This module provides students with an up to date understanding of topics related to the biodiversity and ecosystem function (BEF) debate. We examine the importance of biodiversity in the functioning of marine ecosystems and introduce techniques used to measure key components and complexity of marine systems. We also explore the resilience of marine systems and the impacts of key stressors on BEF such as invasive species, climate change, pollutants and harvest. The module consists of a series of lectures, student-led seminars and practical activities, including some field practicals for data collection and analysis.				
<b>Learning and teaching methods of delivery:</b>	<b>Weekly contact:</b> 2 lectures (x5 weeks), 1 seminar (x5 weeks), field work (either as one multi-day field trip or broken up in shorter periods over multiple weeks)			
<b>Assessment pattern:</b>	Coursework = 80%, Practical Examination = 20%			
<b>Re-assessment pattern:</b>	Coursework = 100%			
<b>Module coordinator:</b>	Dr A J Blight			
<b>Module teaching staff:</b>	Dr A Blight			

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BL5599 Biology Research Project				
<b>SCOTCAT Credits:</b>	60	SCQF Level 11	<b>Semester</b>	Full Year
<b>Academic year:</b>	2019/0			
<b>Availability restrictions:</b>	Students must be enrolled in one of the Biology MSc degree programmes			
<b>Planned timetable:</b>	To be arranged			
<p>The research project forms an important part of the MSc degree. It involves the study of a defined problem within the field of the relevant MSc degree programme. Students will be required to collate and analyse data and discuss their results in the light of existing literature. In some cases, projects might also involve the design of experiments, the gathering of data and/or collaboration with external data providers. Each student will be paired with designated member(s) of staff who will supervise and provide guidance for the duration of the research project. Students will be tasked with developing a research proposal on their project topic early on during their degree programme. Each project will then be written up in the form of a thesis for submission during the summer and presented as a poster during the end of year MSc student conference.</p>				
<b>Learning and teaching methods of delivery:</b>	<b>Weekly contact:</b> To be arranged.			
<b>Assessment pattern:</b>	Coursework = 100%			
<b>Re-assessment pattern:</b>	No Re-Assessment Available			
<b>Module coordinator:</b>	Dr M Johnson			

BL5801 Nutrition for Aquaculture				
<b>SCOTCAT Credits:</b>	20	SCQF Level 11	<b>Semester</b>	Both
<b>Academic year:</b>	2019/0			
<b>Planned timetable:</b>	To be arranged.			
<p>This module provides advanced knowledge of the anatomy, physiology and nutritional requirements of key fish and invertebrate species and a critical assessment of the sustainability of feed production technology. It will also assess and discuss the relationship between clinical nutrition and fish health, the role of microbiota in fish nutrition and the importance of nutrition in developing optimal animal welfare.</p>				
<b>Anti-requisite(s)</b>	You cannot take this module if you take BL5806 or take BL5807			
<b>Learning and teaching methods of delivery:</b>	<b>Weekly contact:</b> Distance learning: 2 x 2-hour lecture (x 10 weeks) and 1 x 3-hour tutorial (x 10 weeks)			
<b>Assessment pattern:</b>	2-hour Written Examination = 40%, Coursework = 60%			
<b>Module coordinator:</b>	Dr N Hazon			
<b>Module teaching staff:</b>	Dr J A David			

BL5802 Management, Husbandry and Sustainability				
<b>SCOTCAT Credits:</b>	10	SCQF Level 11	<b>Semester</b>	Both
<b>Academic year:</b>	2019/0			
<b>Planned timetable:</b>	To be arranged.			
<p>This module provides advanced knowledge of production management and business management of modern aquaculture practices. Environmental, social and economic sustainability of aquaculture depends on an understanding of the interactions of differing but complementary management structures.</p>				
<b>Learning and teaching methods of delivery:</b>	<b>Weekly contact:</b> 4 hours of lectures (x 5 weeks) and 3 hours of tutorials (x 3 weeks).			
<b>Assessment pattern:</b>	2-hour Written Examination = 40%, Coursework = 60%			
<b>Module coordinator:</b>	Dr N Hazon			
<b>Module teaching staff:</b>	Dr J A David			

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BL5803 Health and Disease				
<b>SCOTCAT Credits:</b>	20	SCQF Level 11	<b>Semester</b>	Both
<b>Academic year:</b>	2019/0			
<b>Planned timetable:</b>	To be arranged.			
This module provides advanced knowledge of the factors that influence disease processes in cultured fish and invertebrates including viral, bacterial, parasitic and non-infectious disease. The wide range of specific causes of disease and pathology in farmed species will be discussed and the importance of operations and management on the development and impact of disease in optimising fish welfare and developing sustainable and ethical aquaculture practices will be assessed critically.				
<b>Anti-requisite(s)</b>	You cannot take this module if you take BL5808 or take BL5809			
<b>Learning and teaching methods of delivery:</b>	<b>Weekly contact:</b> Distance learning: 2 x 2-hour lecture (x 10 weeks) and 1 x 3-hour tutorial (x 10 weeks)			
<b>Assessment pattern:</b>	2-hour Written Examination = 40%, Coursework = 60%			
<b>Module coordinator:</b>	Dr N Hazon			
<b>Module teaching staff:</b>	Dr J A David			

BL5804 Markets, Products, Processing and Food Safety				
<b>SCOTCAT Credits:</b>	10	SCQF Level 11	<b>Semester</b>	Both
<b>Academic year:</b>	2019/0			
<b>Planned timetable:</b>	To be arranged.			
This module provides advanced knowledge of aquaculture markets, products, processing and food safety. Understanding the processes of ensuring the safety and quality of aquaculture products is central to establishing efficient and sustainable aquaculture practices.				
<b>Learning and teaching methods of delivery:</b>	<b>Weekly contact:</b> 4 hours of lectures (x 5 weeks) and 3 hours of tutorials (x 3 weeks).			
<b>Assessment pattern:</b>	2-hour Written Examination = 40%, Coursework = 60%			
<b>Module coordinator:</b>	Dr N Hazon			
<b>Module teaching staff:</b>	Dr J A David			

BL5805 Local and Global Impacts of Aquaculture				
<b>SCOTCAT Credits:</b>	10	SCQF Level 11	<b>Semester</b>	Both
<b>Academic year:</b>	2019/0			
<b>Planned timetable:</b>	To be arranged.			
This module provides advanced knowledge of the environmental impact of aquaculture practices on both local and global scales. Understanding the environmental impact of aquaculture practices is central to improving and developing sustainable aquaculture.				
<b>Learning and teaching methods of delivery:</b>	<b>Weekly contact:</b> 4 hours of lectures (x 5 weeks) and 3 hours of tutorials (x 3 weeks).			
<b>Assessment pattern:</b>	2-hour Written Examination = 40%, Coursework = 60%			
<b>Module coordinator:</b>	Dr N Hazon			
<b>Module teaching staff:</b>	Dr J A David			

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BL5806 Nutrition - Invertebrates				
<b>SCOTCAT Credits:</b>	10	SCQF Level 11	<b>Semester</b>	Both
<b>Academic year:</b>	2019/0			
<b>Planned timetable:</b>	To be arranged.			
This module provides advanced knowledge of the anatomy, physiology and nutritional requirements of key invertebrate species and a critical assessment of the sustainability of feed production technology. It will also assess and discuss the relationship between clinical nutrition and animal health and the importance of nutrition in developing optimal animal welfare.				
<b>Anti-requisite(s)</b>	You cannot take this module if you take BL5801			
<b>Learning and teaching methods of delivery:</b>	<b>Weekly contact:</b> 4 hours of lectures (x 5 weeks) and 3 hours of tutorials (x 3 weeks).			
<b>Assessment pattern:</b>	2-hour Written Examination = 60%, Coursework = 40%			
<b>Module coordinator:</b>	Dr N Hazon			
<b>Module teaching staff:</b>	Dr J A David			

BL5807 Nutrition - Vertebrates				
<b>SCOTCAT Credits:</b>	10	SCQF Level 11	<b>Semester</b>	Both
<b>Academic year:</b>	2019/0			
<b>Planned timetable:</b>	To be arranged.			
This module provides advanced knowledge of the anatomy, physiology and nutritional requirements of key vertebrate species and a critical assessment of the sustainability of feed production technology. It will also assess and discuss the relationship between clinical nutrition and animal health and the importance of nutrition in developing optimal animal welfare.				
<b>Anti-requisite(s)</b>	You cannot take this module if you take BL5801			
<b>Learning and teaching methods of delivery:</b>	<b>Weekly contact:</b> 4 hours of lectures (x 5 weeks) and 3 hours of tutorials (x 3 weeks).			
<b>Assessment pattern:</b>	2-hour Written Examination = 60%, Coursework = 40%			
<b>Module coordinator:</b>	Dr N Hazon			
<b>Module teaching staff:</b>	Dr J A David			

BL5808 Health and Disease - Invertebrates				
<b>SCOTCAT Credits:</b>	10	SCQF Level 11	<b>Semester</b>	Both
<b>Academic year:</b>	2019/0			
<b>Planned timetable:</b>	To be arranged.			
This module provides advanced knowledge of the factors that influence disease processes in cultured invertebrate species including viral, bacterial, parasitic and non-infectious disease. The wide range of specific causes of disease and pathology in farmed species will be discussed and the importance of operations and management on the development and impact of disease in optimising welfare and developing sustainable and ethical aquaculture practices will be assessed critically.				
<b>Anti-requisite(s)</b>	You cannot take this module if you take BL5803			
<b>Learning and teaching methods of delivery:</b>	<b>Weekly contact:</b> 4 hours of lectures (x 5 weeks) and 3 hours of tutorials (x 3 weeks).			
<b>Assessment pattern:</b>	2-hour Written Examination = 60%, Coursework = 40%			
<b>Module coordinator:</b>	Dr N Hazon			
<b>Module teaching staff:</b>	Dr J A David			

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BL5809 Health and Disease - Vertebrates				
<b>SCOTCAT Credits:</b>	10	SCQF Level 11	<b>Semester</b>	Both
<b>Academic year:</b>	2019/0			
<b>Planned timetable:</b>	To be arranged.			
This module provides advanced knowledge of the factors that influence disease processes in cultured fish species including viral, bacterial, parasitic and non-infectious disease. The wide range of specific causes of disease and pathology in farmed species will be discussed and the importance of operations and management on the development and impact of disease in optimising fish welfare and developing sustainable and ethical aquaculture practices will be assessed critically.				
<b>Anti-requisite(s)</b>	You cannot take this module if you take BL5803 or take BL5808			
<b>Learning and teaching methods of delivery:</b>	<b>Weekly contact:</b> 4 hours of lectures (x 5 weeks) and 3 hours of tutorials (x 3 weeks).			
<b>Assessment pattern:</b>	2-hour Written Examination = 60%, Coursework = 40%			
<b>Module coordinator:</b>	Dr N Hazon			
<b>Module teaching staff:</b>	Dr J A David			

BL5821 Breeding and Genetics				
<b>SCOTCAT Credits:</b>	10	SCQF Level 11	<b>Semester</b>	Both
<b>Academic year:</b>	2019/0			
<b>Planned timetable:</b>	To be arranged.			
This module provides advanced knowledge of selective breeding programmes and modern genetic techniques applied in aquaculture practices. Scientific and ethical issues raised by the application of genetic engineering will be examined with the context of developing sustainable aquaculture.				
<b>Learning and teaching methods of delivery:</b>	<b>Weekly contact:</b> 4 hours of lectures (x 5 weeks) and 3 hours of tutorials (x 3 weeks).			
<b>Assessment pattern:</b>	Coursework = 100%			
<b>Module coordinator:</b>	Dr N Hazon			
<b>Module teaching staff:</b>	Dr J A David, Prof K Rana			

BL5822 Advanced Welfare and Ethics				
<b>SCOTCAT Credits:</b>	10	SCQF Level 11	<b>Semester</b>	Both
<b>Academic year:</b>	2019/0			
<b>Planned timetable:</b>	To be arranged.			
This module provides advanced knowledge of the welfare and ethical issues raised by current aquaculture practices. Animal welfare is rapidly developing as a major ethical issue within all areas of food production including aquaculture. Future development of sustainable aquaculture must incorporate ethical practices, optimising animal welfare and as a consequence improving the final product.				
<b>Learning and teaching methods of delivery:</b>	<b>Weekly contact:</b> 4 hours of lectures (x 5 weeks) and 3 hours of tutorials (x 3 weeks).			
<b>Assessment pattern:</b>	Coursework = 100%			
<b>Module coordinator:</b>	Dr N Hazon			
<b>Module teaching staff:</b>	Dr J A David			

<b>BL5823 Recirculation Aquaculture Systems</b>				
<b>SCOTCAT Credits:</b>	10	SCQF Level 11	<b>Semester</b>	Both
<b>Academic year:</b>	2019/0			
<b>Planned timetable:</b>	To be arranged.			
This module provides advanced knowledge of the use of recirculating aquaculture systems in modern aquaculture practices. Recirculating aquaculture systems potentially provide environmentally sustainable aquaculture practices but must be assessed and viewed within the context of ethical, financial and social components of sustainability.				
<b>Learning and teaching methods of delivery:</b>	<b>Weekly contact:</b> 4 hours of lectures (x 5 weeks) and 3 hours of tutorials (x 3 weeks).			
<b>Assessment pattern:</b>	Coursework = 100%			
<b>Module coordinator:</b>	Dr N Hazon			
<b>Module teaching staff:</b>	Dr J A David			

<b>BL5824 Ornamental and Aquaria Production</b>				
<b>SCOTCAT Credits:</b>	10	SCQF Level 11	<b>Semester</b>	Both
<b>Academic year:</b>	2019/0			
<b>Planned timetable:</b>	To be arranged.			
This module provides advanced knowledge of animals produced by the ornamental and aquaria section of the aquaculture business. This sector of the aquaculture business has specific issues with relation to establishing sustainable aquaculture practices. In particular, the sustainability and ethical issues with reference to both captive breeding systems and wild caught fish supply will be examined and assessed for different trade sectors.				
<b>Learning and teaching methods of delivery:</b>	<b>Weekly contact:</b> 4 hours of lectures (x 5 weeks) and 3 hours of tutorials (x 3 weeks).			
<b>Assessment pattern:</b>	Coursework = 100%			
<b>Module coordinator:</b>	Dr N Hazon			
<b>Module teaching staff:</b>	Dr J A David, Prof K Rana			

<b>BL5825 Larval Rearing</b>				
<b>SCOTCAT Credits:</b>	10	SCQF Level 11	<b>Semester</b>	Both
<b>Academic year:</b>	2019/0			
<b>Planned timetable:</b>	To be arranged.			
This module provides advanced knowledge of the larval production techniques used in the aquaculture business. Larval production is often the rate limited step in development of new aquaculture species and presents particular ethical and sustainability issues with regard to current production techniques.				
<b>Learning and teaching methods of delivery:</b>	<b>Weekly contact:</b> 4 hours of lectures (x 5 weeks) and 3 hours of tutorials (x 3 weeks).			
<b>Assessment pattern:</b>	Coursework = 100%			
<b>Module coordinator:</b>	Dr N Hazon			
<b>Module teaching staff:</b>	Dr J A David			

BL5899 Sustainable Aquaculture Research Dissertation				
<b>SCOTCAT Credits:</b>	60	SCQF Level 11	<b>Semester</b>	Full Year
<b>Academic year:</b>	2019/0			
<b>Planned timetable:</b>	To be arranged.			
<p>The research dissertation will involve the study of a defined problem within the field of Sustainable Aquaculture. Students will be required to collate and analyse data and to discuss their results in the light of existing literature. In some cases, projects might also involve the design of experiments or the gathering of data. Each project will be written up in the form of a thesis.</p>				
<b>Learning and teaching methods of delivery:</b>	<b>Weekly contact:</b> Individual supervision			
<b>Assessment pattern:</b>	Dissertation of up to 15,000 words = 100%			
<b>Module coordinator:</b>	Dr N Hazon			